# KEYFRAME MAGAZINE

The Ultimate Guide to 3D Animation & Special Effects

SIGGRAPH 2004

## SPECIAL EDITION

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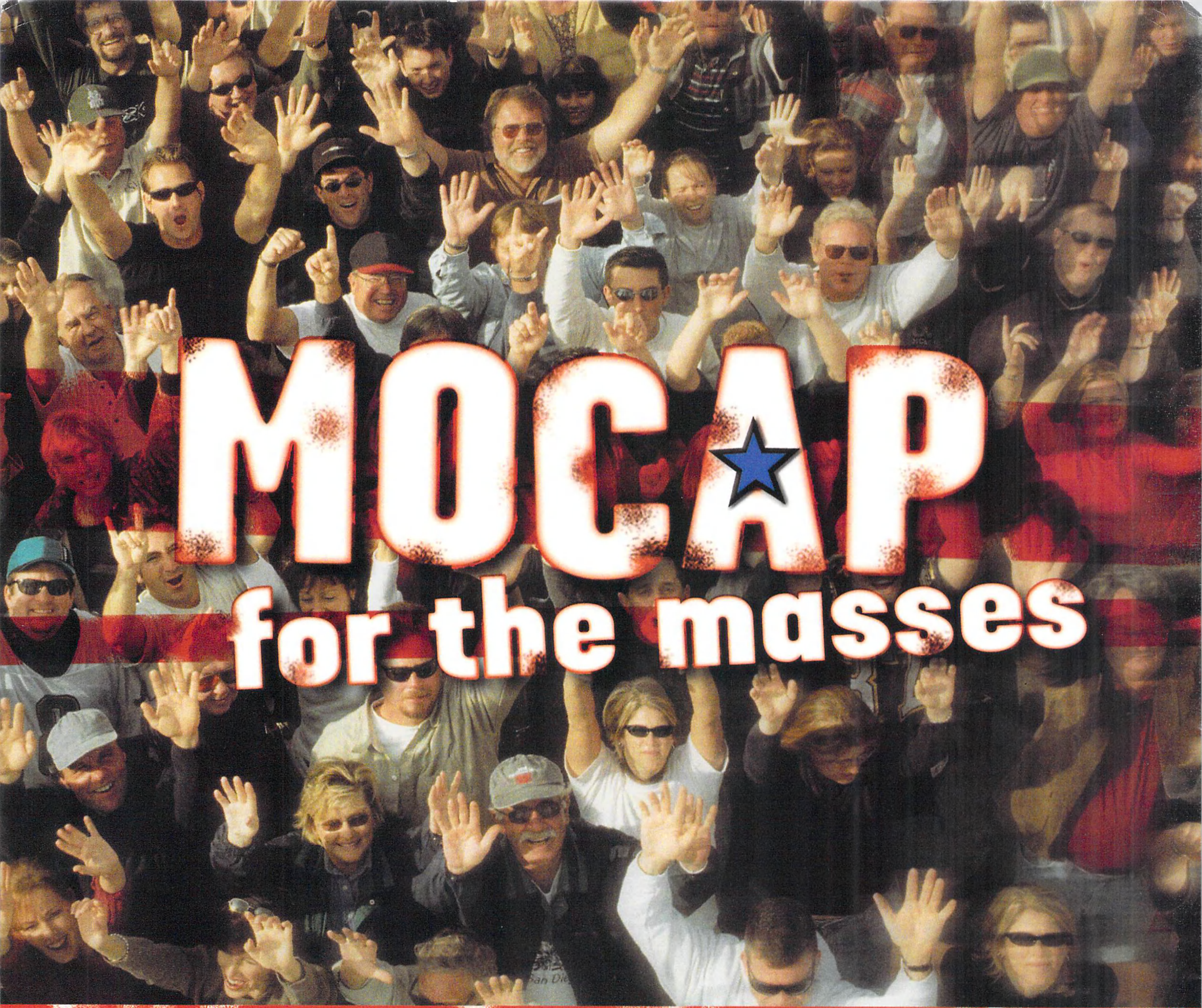

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NEWS
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MORNING

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Tim Johnson,
Emmy Award Winning
Broadcast Graphic Artist
KUTV, Salt Lake City, Utah

NewTek

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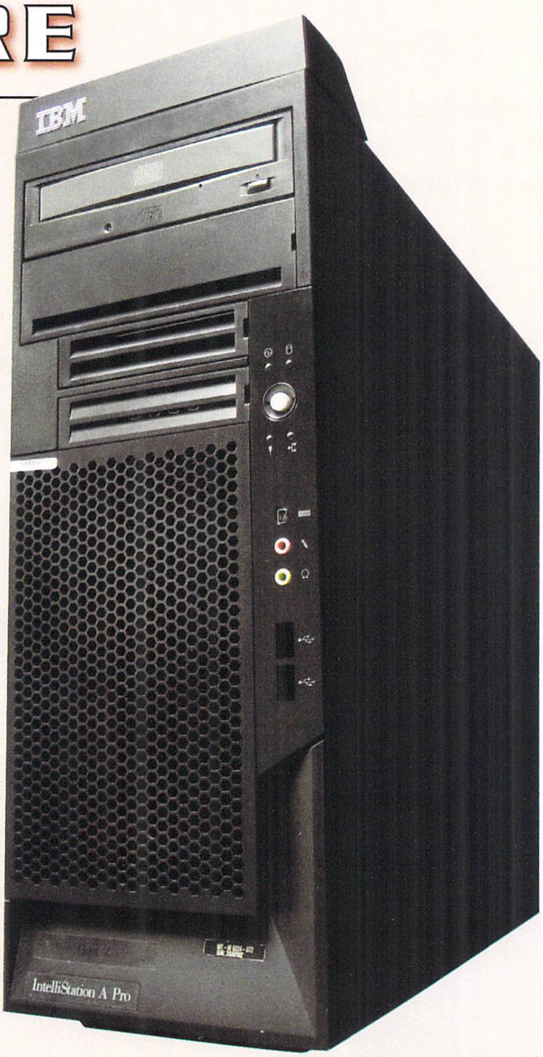
BY DAN ABLAN

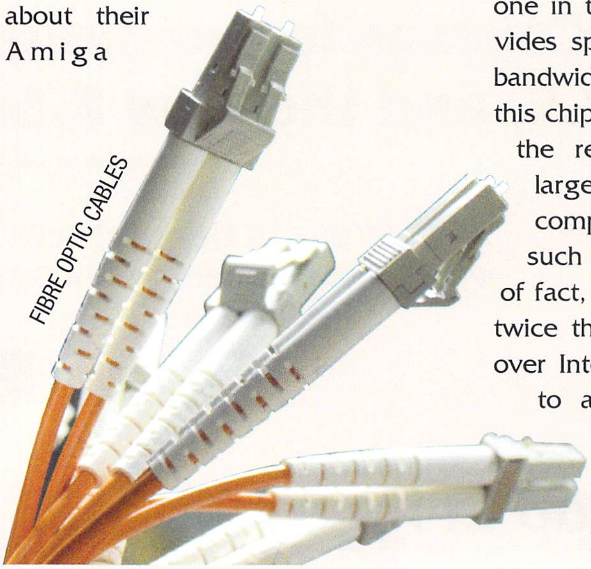
# BLAZING 500MB+ SUSTAINED TRANSFER WITH FIBRE

It was 1992 and NewTek, Inc. was holding a seminar at the Merchandise Mart in Chicago promoting LightWave 3.0. So many things had changed in the few years LightWave was on the market—new tools were added, computer add-on's for speed became available, and the software was further optimized. It was also very exciting because the LightWave interface now had color! That's right, selected buttons were no longer just a lighter shade of gray, but yellow! It was breathtaking. But on the other side of the room was this big, red, twisted but cool-looking box. They called it "The Screamer," and it had the power of something like ten 040 processors. The 040 was the GVP 68040 Accelerator Boards made for the Commodore Amiga 2000 (and 2500) computers. The Amiga, as you might know, was the host to the original Video Toaster and LightWave 3D. That accelerator board gave us "pros" the extra power and render speed we needed. After all, those in attendance were serious about their Amiga computers and had upgraded to a whopping 32MB of RAM, and the boost in processing power was essential!



THE IBM A PRO

Flash forward to my office 12 years later. I'm sitting in front of an unassuming IBM tower—Color: black. It contains two AMD 64-bit Opteron™ processors. This chip can run in both 64-bit and 32-bit environments, making it ideal for those who want to use their current applications but are looking to the future and more robust programs. The Opteron™ chip features larger amounts of onboard cache, an integrated memory controller, and HyperTransport bus technology. HyperTransport is a point-to-point link architecture designed for high bandwidth and low latency between integrated circuits. This smart technology links the processors and chipsets on Opteron™ boards (such as the one in the IBM A Pro) and provides speeds up to 19.2GB/s of bandwidth per processor. This makes this chip different and stand out from the rest because it's scalable. A larger cache will greatly increase computing intense applications, such as 3D rendering. As a matter of fact, the Opteron™ has more than twice the amount of available cache over Intel's Xeon processor. In order to accommodate more memory and speed up applications, the Opteron™ also has a faster memory path with 64-bit extensions. By integrating the memory controller onto the chip, the memory bus has been increased to equal the clock rate of the processor. Clock rates for memory are usually slower than the processor.



FIBRE OPTIC CABLES

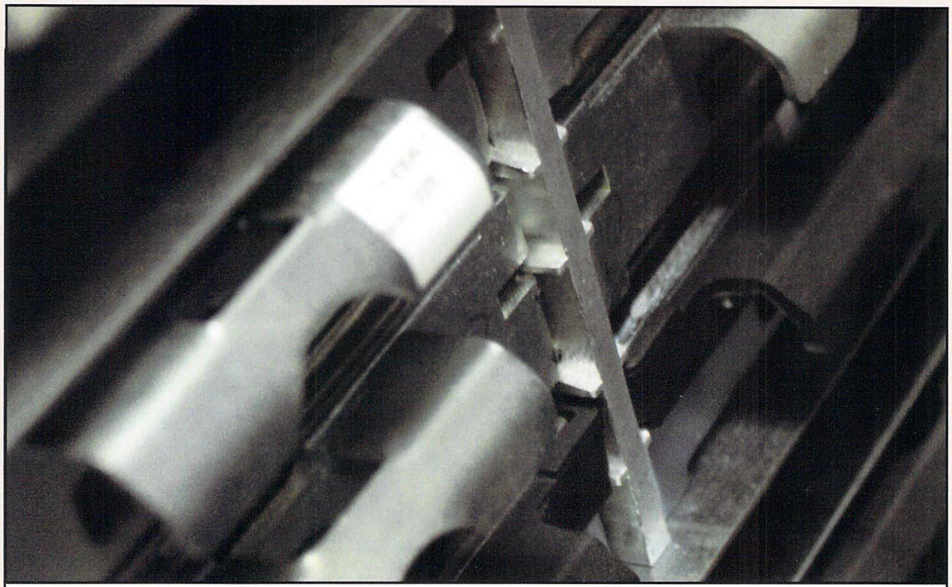
What happens then is that, when a processor looks to memory for instruction, many clock cycles are wasted. This is not the case with the 64-bit Opteron™. What's cool is that, as Opteron™ processor speeds increase, the memory speed increases as well. The benefit is that, when memory and processor clock-rates are running at the same speeds, the latency for memory calls is greatly reduced.

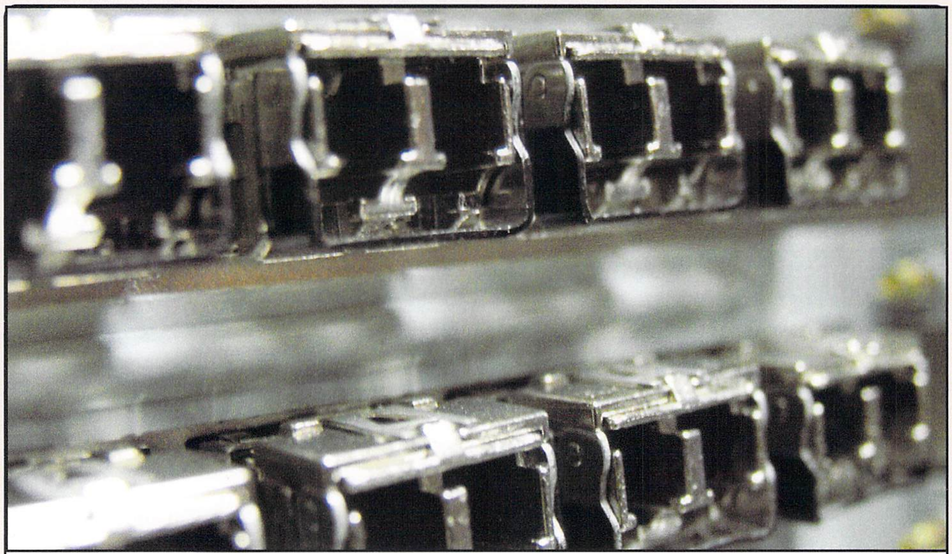
Back to the setup in my office: To the side of the IBM A Pro stands a large box outfitted with some heavy-duty hardware from a company named Xtore. Within this box sits 48 hard drives equaling roughly 1 terabyte of storage, chained together into eight fibre optic channels. One terabyte (TB) is 1000 gigabytes. Add to that one slick new VT[3] card from NewTek, and there stands a super system that rivals digital video workstations costing well into the six figure range. The difference between this system and that "Screamer" I saw in 1992 is inconceivable. Why's that? Glad you asked. It's all about speed, my friends, speed. The Xtore setup, combined with the IBM A Pro Dual Opteron™ and with an added VT[3] package, make for the ultimate digital non-linear system. The VT[3] is an uncompressed non-linear editor and is only limited by the speed and resources of the system it's running on, so it's ideal for this particular setup.

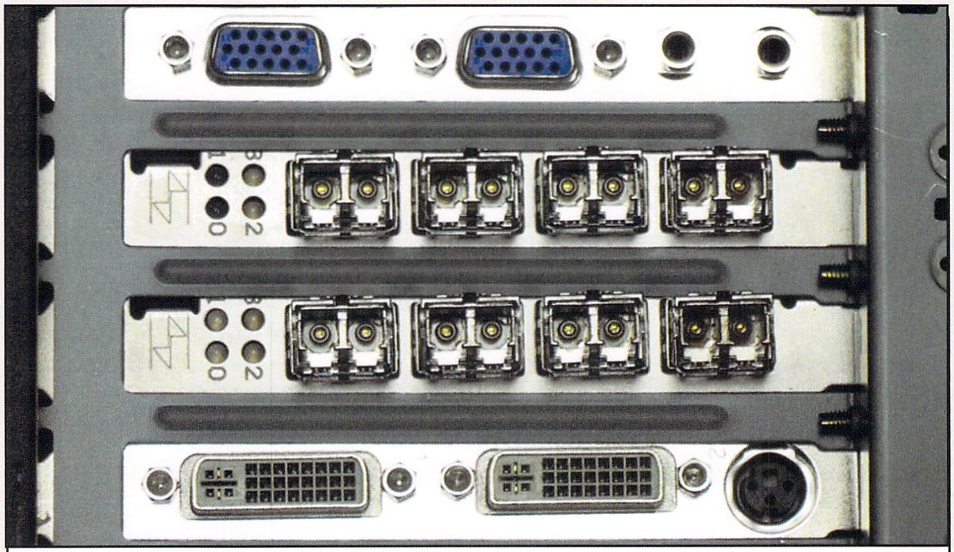
## *A SYSTEM BUILT FOR SPEED*

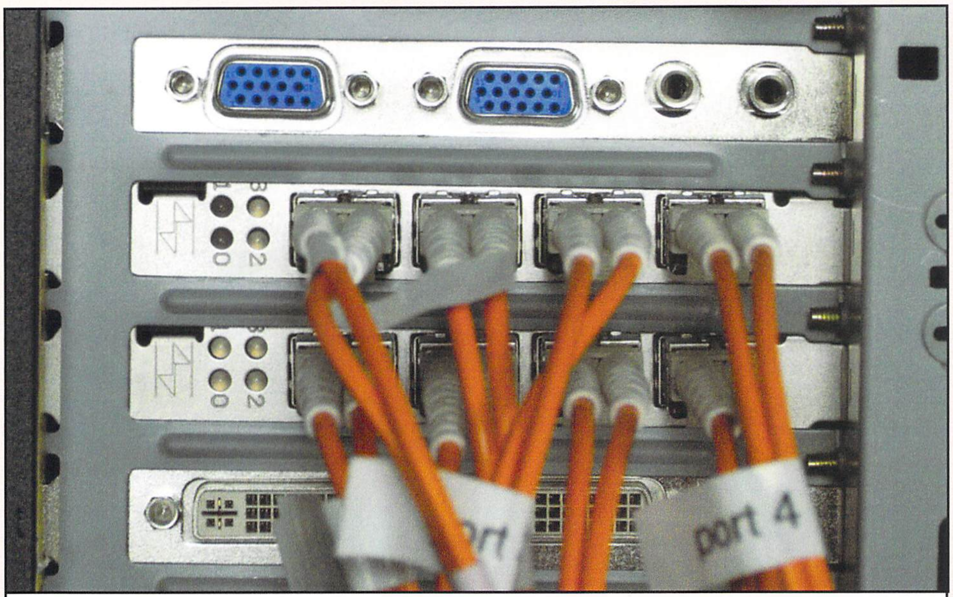
The computer—an IBM A Pro, is running Dual Opteron™ 64-bit chips at 2.2GHz. It has 3GB of RAM and an NVIDIA Quadro FX 1100 video card. NewTek's VT[3] production system includes a non-linear editor, broadcast switcher, character generator, LightWave 3D, and more. While your everyday 5400 RPM drive runs at around 20MB per second, the Xtore fibre setup tested has a data rate of 500MB per second. How is this speed possible? Xtore has done it with a fibre channel RAID.

The full system consists of eight 12-bay storage units with two fibre RAID (RAID = Redundant Array of Independent Disks.


THE HARD DRIVES IN THE 1 TERABYTE ARRAY – 48 DRIVES IN ALL


THE XTORE FIBRE CHANNEL PORTS


BACK OF THE IBM A PRO – VT3 ON TOP, XTORE FIBRE CONNECTIONS, AND THE NVIDIA GRAPHICS CARD



THE FIBRE CABLES CONNECTED TO THE PORTS

The “I” also sometimes stands for “Inexpensive.”) controllers per unit. To get the best speed possible, each controller was striped to six drives into separate LUNs (Logical Unit Number: The computer will see a LUN as a single large drive.) Striping = RAID 0, and there are many different RAID levels depending on the speed, redundancy, and expense required for the application. RAID 0 is the fastest level, but there is no redundancy. What that means is, if a single drive fails, your data is gone. Then, each LUN is mapped to its own fibre port on the fibre HBA (Host Bus Adapter)—this is the fibre card in the computer. Xtore provided two LSI Quad Port Optical HBAs into the IBM A Pro. Each Fibre port has a maximum throughput of 200MB per second, so each card has a maximum throughput of 800MB per second, minus general system overhead, through optical fibre cables.

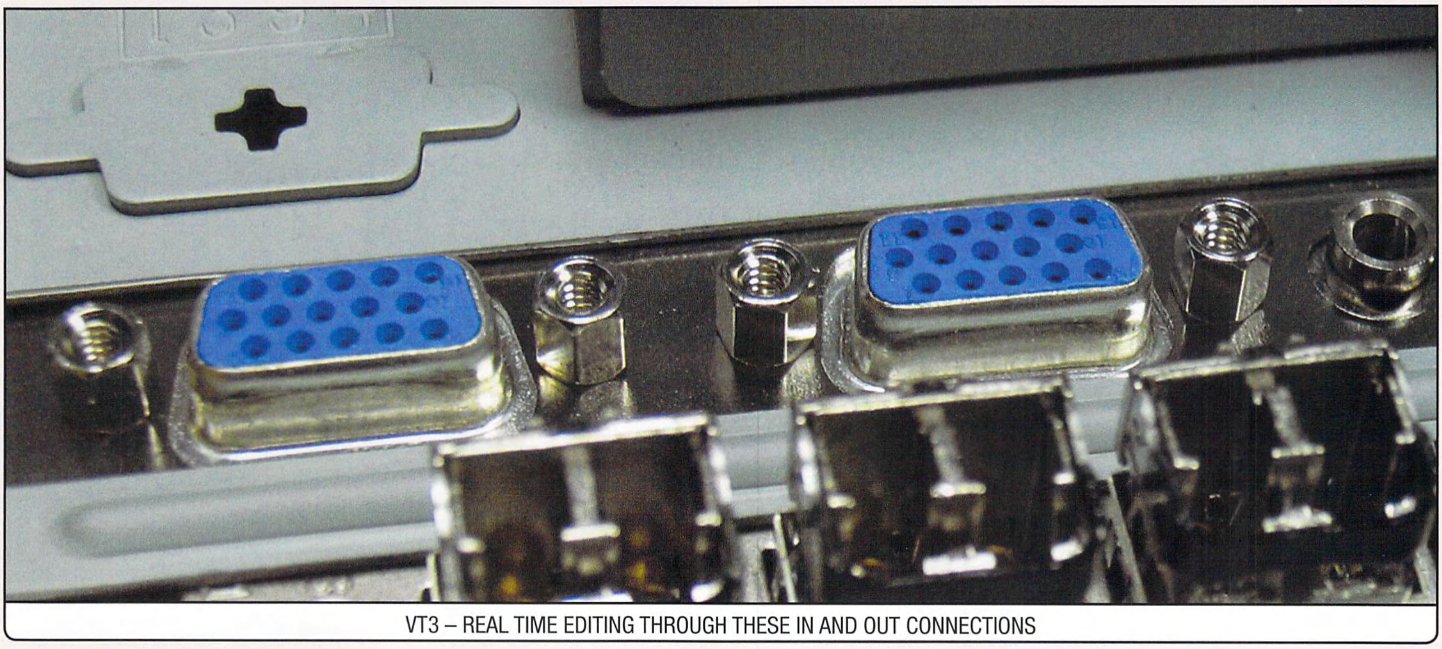
From here, when the system boots to Windows XP Professional, there is one large hard drive—nearly a terabyte, or 1000GB. Upon entering the Disk Manager, there are eight very large, but separate hard drives (with the full system). All were striped together through the operating system. Again, striping is the fastest RAID level.

What this means is that you can run 6, 8, 10 or more streams of uncompressed video in real time. It’s truly amazing to work without rendering. Our current Final Cut Pro SCSI RAID system can’t touch it! The concept of this type of setup is that the eight Xtore dual controller storage units filled with fast fibre drives (15k is the fastest) will saturate each fibre loop, allowing 200MB per second per controller. The system then has over 2GB per second available from the storage. So the main challenges are getting a system that can handle the speed.

The A Pro has three PCI-X 100MHz buses. A 100MHz PCI-X bus has a maximum bandwidth of 800 milliseconds (minus overhead), so the system is able to handle the speed from the fibre channels Xtore provided. There is a fourth HBA in there, so that there is a little extra bandwidth, just in case we couldn’t combat the hardware and operating system overhead. However, everything ran like a champ and data rates remained consistent.

Now, with all of the technical babble out of the way, what can a system like this do for you? Well, it depends on how you use it, but I’ll tell you what it’s doing for me. I read a lot of reviews, and overall they don’t tell me anything more than what I just told you. Speed, processor, RAM, blagh blagh blagh. I wanted to have this article take a larger step forward than most and fortunately, during the process of testing this beast, I was working 16-hour days on three projects. Two of which were quite large, one for United Airlines, the other for NASA. The United Airlines project was a real test of any system we had in our studio. I successfully crashed system after system while trying to render millions of ray-traced polygons. Imagine a full 3D aircraft if you will, with detailed seats in first class, business, and coach. Add to that the buttons and knobs on each seat, as well as all of the other necessary details, area lighting with shadows, reflections, and about 300MB of texture maps. Even using an instancing plug-in for LightWave to save memory and resources, our main Dell Dual Xeon with 2 Gigs of RAM took nearly 10 minutes per frame to render for a broadcast resolution sized image. I’m sorry, but those render times are ridiculous, especially when a client is waiting. Over on the A Pro Dual Opteron™, that same image rendered in roughly 3½ minutes. Still heavy, but 7 minutes a frame times 3000 frames.... well, you can do the math. LightWave 3D [8] stepped up to the challenge and used the processors of the dual Opteron™ quite well.

The next project I tested on the system really put Xtore’s drives to the test. While the United Airlines project ran the A Pro processors and memory through its paces, the NASA project truly relied on the speed of the Xtore fibre channels, drive speed, and, of course, NewTek’s VT[3]. This project is video based, incorporating at times up to 14 layers of graphics, video, stills, and character generation elements. Most systems today, even a laptop, can handle two or possibly three layers of video and graphics. However, most of those systems need

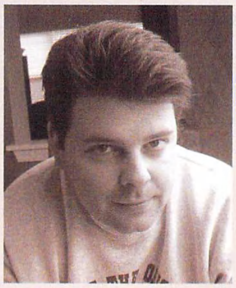


VT3 – REAL TIME EDITING THROUGH THESE IN AND OUT CONNECTIONS

to render the secondary video and overlay channels. The project begins with a rendered 3D animation brought into TED, the VT[3]'s non-linear editor. An audio bed is dropped in. Added to this are a number of still images, each of which have been scaled in size, have had edges softened, and have been positioned. From there, CG elements from VT[3]'s Character Generator are animated in one layer at a time. Sound effects are added as needed, and all of this is done in real time. What's interesting about the VT[3] is that is has a background rendering feature that is continually processing your clips, layers, keys, dve's, and so on. You actually don't even know that it's working. Now throw that intelligent software into a system like the IBM A Pro with an Xtore fibre RAID setup, and you literally can work in real time. And here's the thing about "real time"—everyone says it, but not everyone delivers it. A studio I used to work in had a very popular yet very expensive $120,000 editing system. It had to render anything more than three layers, but it was "real time." Give me a break!

When putting together this current project, I was amazed at how well everything came together. That is, the project required heavy use of the NVIDIA graphics card for updating the interface on a dual monitor system. The processors were put through their paces because the VT[3] program interface is multithreaded, and the power of the dual Opteron™ was evident while working throughout a graphically heavy application. I experienced no slow downs at all, as I normally do with my dual Xeon. Finally, the speed at which the fibre channels performed allowed all of the layers to update and playback in real time, meaning, once I placed them into the timeline, I was able to hit the space bar and see the results. The system is extremely flexible and can work with fewer drives than I have here. The projects mentioned were done with 48 hard drives, although, if time had allowed, we would have tested 96 drives! But even with just 48 drives we see a consistent 500MB per second transfer rate, which is truly amazing. The system can start small with less speed (and less hard drive space), then work up to more speed and more hard drive space. This flexibility is ideal for a boutique 3D and post facility such as ours. We have a full non-linear suite, a complete pro-tools audio suite, and, of course, a generous 3D animation suite. Xtore's fibre channels can be used throughout our studio because the fibre cable can travel up to 300m, unlike typical SCSI channels.

Clearly, this system can work for both the small, independent video jock or the serious, high-end professional. It's affordable enough for the little guy to have some serious power, yet fast enough not to slow down the professionals. I think back to that day in 1992, fantasizing about renders that took less than 10 minutes a frame. I remember the RM-440 editor we used to use along side our clunky ¾ inch tape machines. We all used to dream of speed and ease of use—this week I realized it. ■



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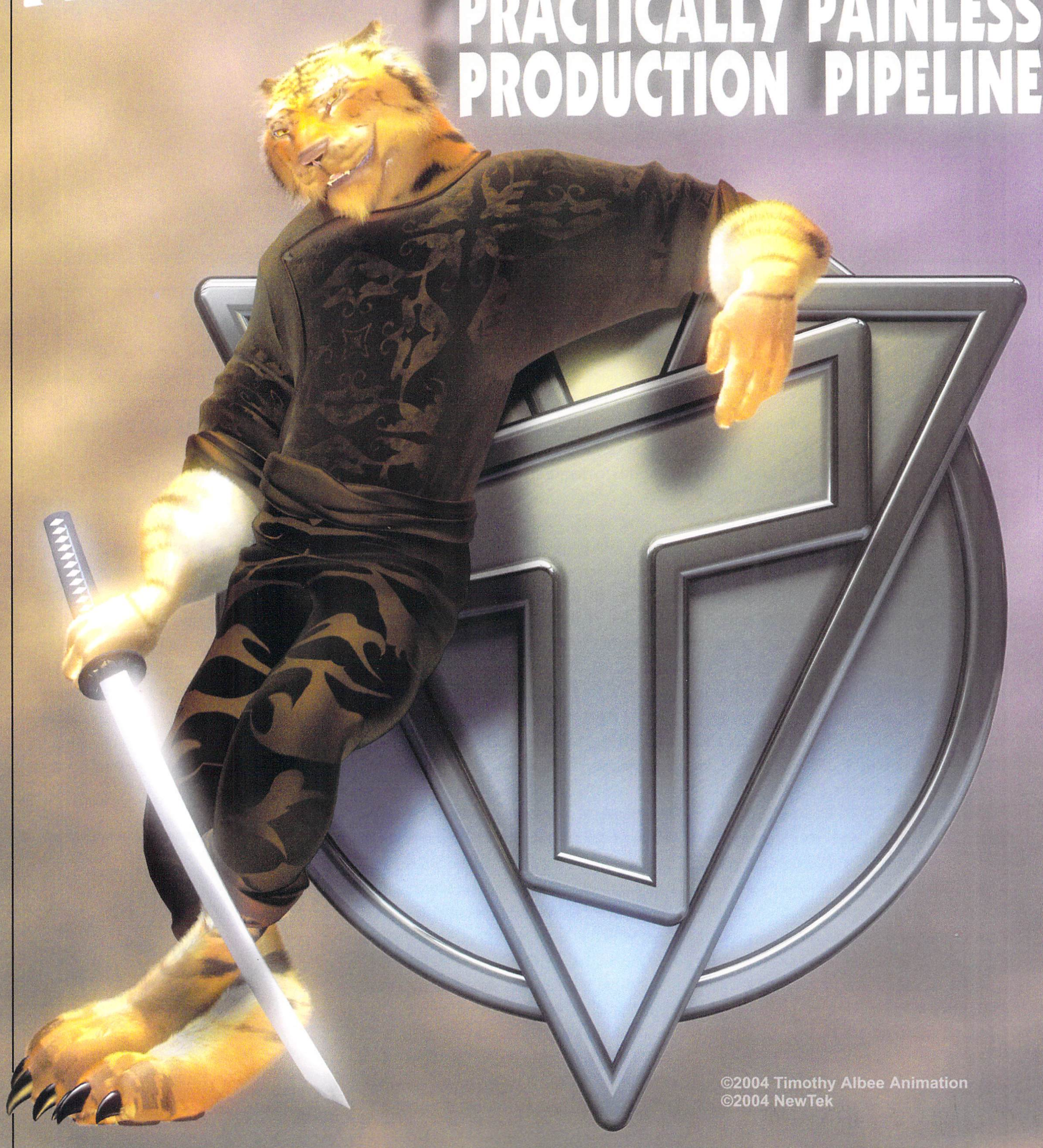
*BY TIMOTHY ALBEE*

# Kaze, Ghost Warrior and the PRACTICALLY PAINLESS PRODUCTION PIPELINE



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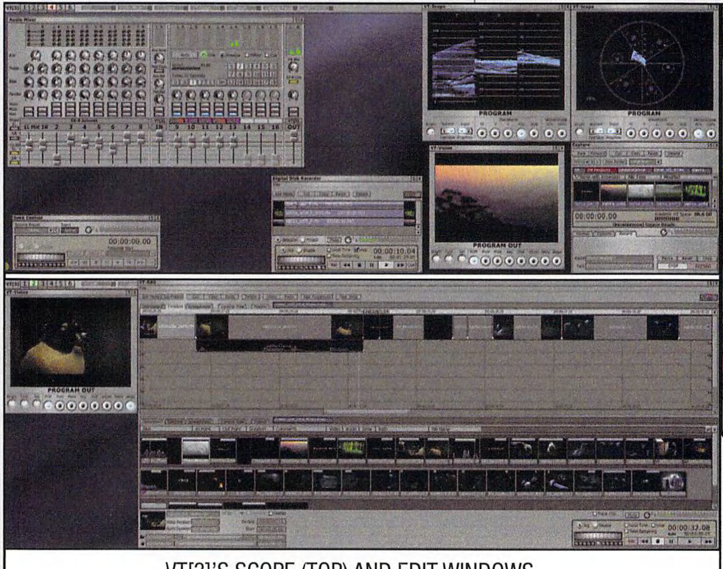
> ***"GENERALLY, MANAGEMENT OF MANY IS THE SAME AS MANAGEMENT OF FEW. IT IS A MATTER OF ORGANIZATION."***
>
> **– SUN TZU, *THE ART OF WAR***

I remember seeing the packaging for the new VT[3]. "Television studio in a box," it said.

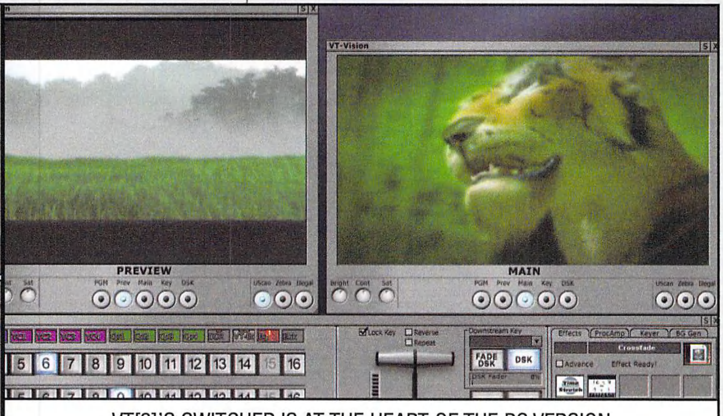
That's heavy-duty.

From knowing how the majority of modern marketing works, I admit, I was skeptical...at first.

But during the production of *Kaze, Ghost Warrior,* after having pushed this package to limits that would have broken anything else I've used and seeing it tackle everything I threw at it with ease, I have to admit, I was impressed.



VT[3]'S SCOPE (TOP) AND EDIT WINDOWS



VT[3]'S SWITCHER IS AT THE HEART OF THE PC VERSION

## *WHAT IS THE VT[3]?*

For those not familiar with the new PC-based incarnation of the old Video Toaster, hold onto your hairnets, 'cause this thing packs a wallop.

The VT[3] is a hardware/software integration the likes of which I've never seen before. (Upgrades are more than just software and manuals; they also "flash" the VT[3] card's core with new code for additional functionality.)

As you can see from the above images, each tool's interface is designed to be a replica of its real-world equivalent. If you know how to use the real-world version of a tool, you already know how to use the VT[3] version!

Because of the hardware on the VT[3]'s card, everything in the VT[3] is all real time—keying, special effects, text crawls, transitions—you name it. And the keyboard controls are set up in such a way that shows that the people at NewTek have a mind for what you'd need to run a live, multi-camera feed for news, sports or whatever (which the VT[3] can also stream, live, over the Internet).

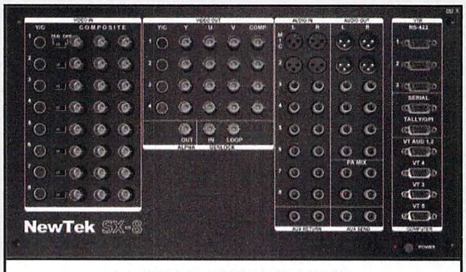
As with the original "Video Toaster," at the heart of the PC version is the Switcher. You can cut, dissolve, scroll, flip.... You have access to more ways to switch between two video sources (live or pre-recorded) than you'll ever know what to do with.

One of the great things that took a while to discover about the VT[3] is that you can create your own transitions that work in real time with live and recorded video!

Using the DVE Creation Kit, you can quickly and easily create exactly the transition you want. Are you looking for the kind of soft-edged *Star Wars* wipe? You can make one in a matter of about 10 minutes. How 'bout something reminiscent of the transitions on *Home Improvement?* You can do that too!

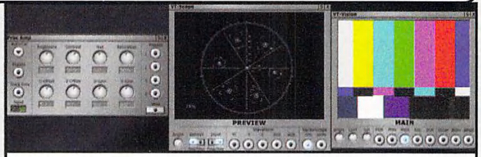
If you can animate it in LightWave, you can use it as a transition, complete with real-time reflections, refractions, shadows and motion blur.

(I made a quick little tool using the DVE Creation Kit that lets you view 16:9 work correctly on your 4:3 television monitor, all in real time. You can download it for free from the Keyframe website: Click on the Resource Files link at: http://www.KeyframeMag.com.)



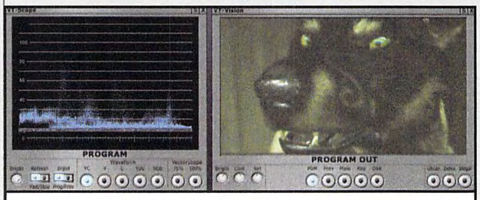
THE SX-8 BREAK-OUT BOX

And with the optional SX-8, "break-out box," you can switch live from eight Component video sources...or, eight S-Video and eight Composite...or, 24 Composite video sources! You also get four video outs, eight stereo audio ins (two of which are XLR), six standard stereo audio outs (two of which are XLR), two stereo PA Mix audio outs, stereo Aux Send/Receive (for effects), and deck control.



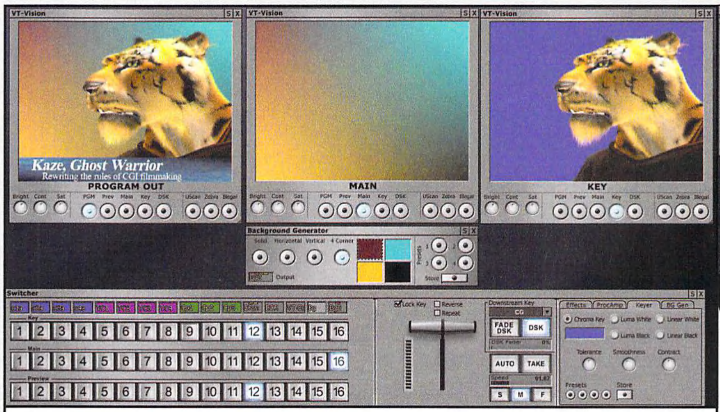
THE VT[3] VECTORSCOPE

The VT[3] has a 60-field-per-second Vectorscope from which you can manually calibrate your video input on the Proc/Amp (or let the Proc/Amp calibrate itself automatically from color-bars).

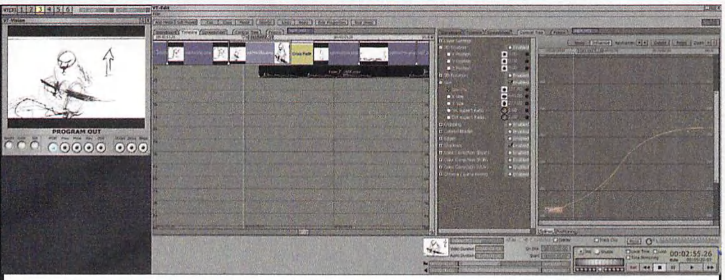


THE VT[3] WAVEFORM MONITOR

There's also a 60-field-per-second Waveform Monitor you can use to make sure your signal is legal for your broadcast standard (NTSC, [USA/Japan], and PAL).


VT-Vision
Kaze, Ghost Warrior
Rewriting the rules of CGI filmmaking
PROGRAM OUT
MAIN
KEY
Background Generator
Switcher
AUTO
TAKE

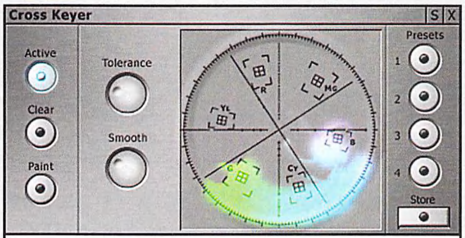
VT[3]'S CHROMA/LUMA-KEYER


VT-Edit
PROGRAM OUT

VT EDIT – AN ALL-REAL-TIME EDITING SYSTEM

In addition to supporting robust, real-time Background and Character/ Graphic Generators, the VT[3] also sports the best real-time Chroma/ Luma-keyer I've ever seen. (Shown here, keying Kaze over a 4-Corner BG, and a Downstream Key of a quick, "Lower-Third" output from the VT[3]'s Character Generator. Note the high quality of the key in the "wispy" areas of Kaze's chin and ear fur.)

The Downstream Key overlays its source on top of VT[3]'s Program Out and supports full-screen stills and video with full eight-bit Alpha for "Lower Thirds," "Side Bars," and other "network graphics."


Cross Keyer
Active
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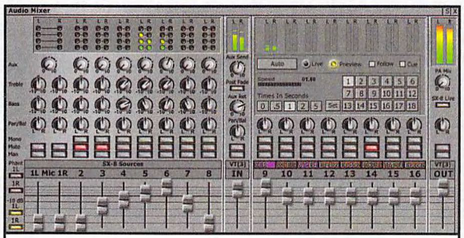
THE VT[3] CROSS KEYER

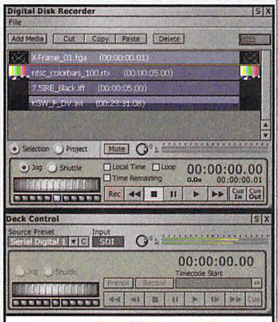
Something that's very neat, is the Cross Keyer, a tool that lets you Key-out multiple colors by "painting" on a Vectorscope.


Audio Mixer
SX-8 Sources

VT[3]'S AUDIO MIXER

The VT[3]'s Audio Mixer is a software version of a 16-channel studio mixer that also has the functionality of those automated "robot mixers" that are so popular in big studios. The Audio Mixer supports Phantom Power and full Pan/Bal Treble, Bass, Aux Send/Receive for SX-8 audio sources and 18 Presets that can be instantly activated or smoothly "faded in" over up to 58 seconds.

As mentioned before, one of the nicest things about the VT[3] system is the fact that all the interfaces are digital versions of their real-world counterparts. Here you see the Digital Disk Recorder and Deck Control interfaces. (The VT[3] can input/output from/to standard serial-controlled decks, Serial Digital decks, and an unlimited number of DV cameras/decks. And, of course, the VT[3] supports a robust Batch Capture system for these sources.)


Digital Disk Recorder
Add Media
Cut
Copy
Paste
Delete
X-Frame_01.tga (00:00:00.01)
ntsc_colorbars_100.rtv (00:00:05.00)
7.5IRE_Black.iff (00:00:05.00)
KSW_F_DV.avi (00:23:31.08)
00:00:00.00
Deck Control
00:00:00.00

DIGITAL DISK RECORDER

## THE PRACTICALLY PAINLESS PRODUCTION PIPELINE

If you don't have time or money to waste, you've got to make sure that every decision you "put to bed" on your production is a decision you can live with for all eternity. You've got to stride confidently forward, do what you need to do, and then move onward. At its core, a Production Pipeline is the path your vision takes from your imagination to the screen.

Part of what I try to drill into readers of *CGI Filmmaking* is the importance of, "Never move backwards." This is one of the key "secrets" of the "Practically Painless Production Pipeline."

The most important part of any work of Visual Storytelling is the way in which visual elements are strung together to choreograph the emotions of the audience. This begins with your story, as made manifest through the script, shot list, and storyboards, as well as the way in which your beautifully rendered, emotionally powerful footage is brought together to tell your story: Editing.

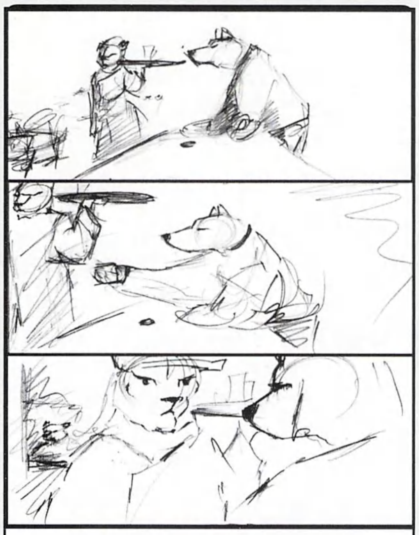
Editing isn't something to be thought of only after all your footage has been animated or shot. It is something that should be strongly in the mind of the director even as the script is being finalized. The final edit will completely shape the audience's impression of your film and, in my experience, it is a cornerstone of the "Practically Painless Production Pipeline."

VT Edit is an all real-time editing system that supports an unlimited number of audio and video tracks. Every aspect of each clip is animatable with "sharp" or "smooth" Splines. And it also background-saves Undos for everything you do (the default setting saves up to 100 of these small, complete versions of your Project).

The way VT Edit handles Undos means that you can come back to your project years later and still have a full selection of your Undos. It also means that, even if the power goes out and your UPS chooses that moment to stop working, you still have a complete version of your work, right up to the very last change you made!

## STORYBOARDS

Storyboards are your way of seeing how the elements in your story will work when translated into the medium of Visual Storytelling. "They allow you to make your film for the cost of a few pencils and some paper." - Peter Jackson.



STORYBOARDS OF A SCENE FROM KAZE: GHOST WARRIOR

Storyboards don't have to be works of art, but they do have to clearly convey the emotion and story point behind each and every camera setup and movement. You get a good idea of how much lays out ahead of you by tallying the number of Storyboards you have to draw to clearly convey every emotional element of your story.

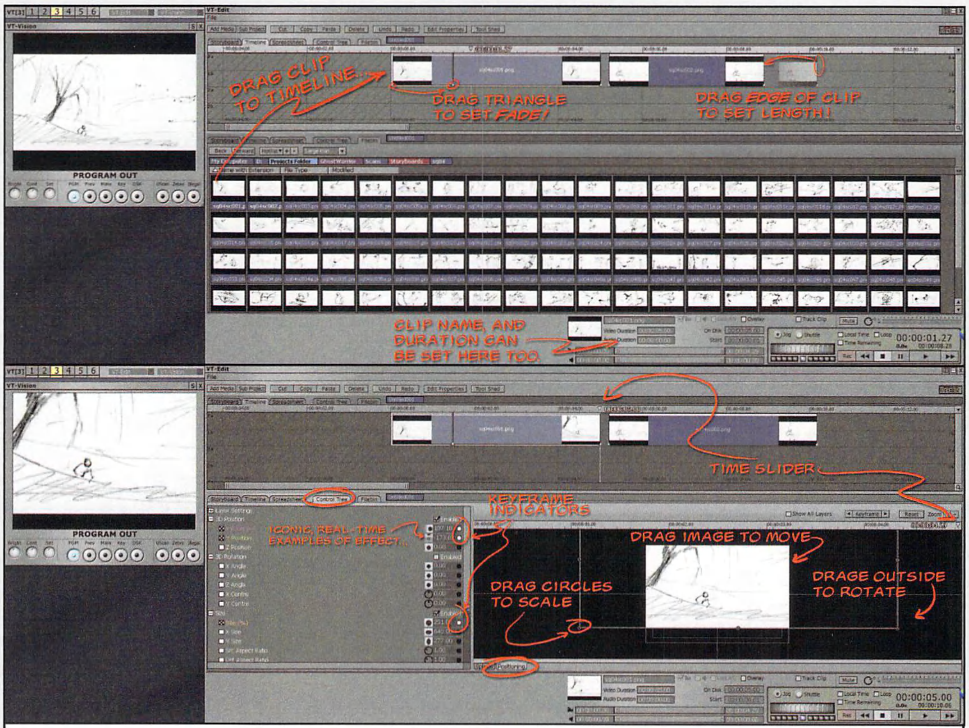
With good Storyboards, you'll know right away what is working, and what needs re-working—so don't skimp!

Once you've got your 'Boards done, tack them up on a wall and walk by them, then imagine seeing them play out on the "Big Screen" in a theatre filled with your closest friends and harshest critics. When you can do this and feel confident about what you're seeing, it's time to move on to the next step.

## *ANIMATIC*

An Animatic is a "video" of your Storyboards. The 'Boards are timed (using a stopwatch, imagine seeing the scene played out in your mind) and held as long as they need to be in order to register the story point each serves to illustrate. The Animatic is then updated with dialogue, music and sound effects as each part of the process is completed.

An Animatic brings you one step closer to a finished film. It lets you refine your "brush strokes" one step further toward completion. Through evaluating the Animatic, you know what stays, what goes, and what needs re-working.


DRAG CLIP TO TIMELINE...
DRAG TRIANGLE TO SET FADE!
DRAG EDGE OF CLIP TO SET LENGTH!
CLIP NAME AND DURATION CAN BE SET HERE TOO
PROGRAM OUT
00:00:01.27
TIME SLIDER
KEYFRAME INDICATORS
ICONIC, REAL-TIME EXAMPLES OF EFFECT...
DRAG IMAGE TO MOVE
DRAG CIRCLES TO SCALE
DRAGE OUTSIDE TO ROTATE
00:00:05:00

VT EDIT – STORYBOARDS IN VT EDIT PLACED IN TIMELINE (TOP). CONTROL TREE ALLOWS YOU TO ADD SOME REAL-TIME MOVEMENT

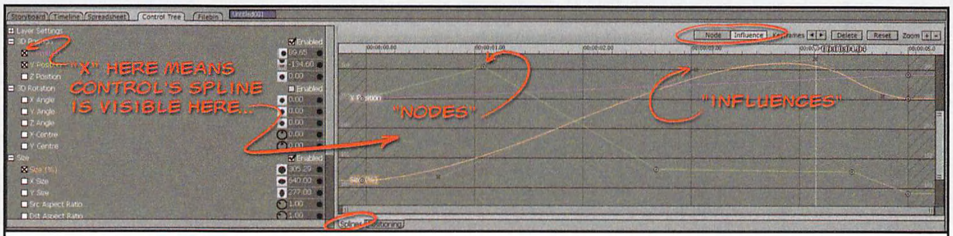
To begin creating your Animatic in VT Edit, browse a Filebin view to the location of your scanned Storyboards. Drag each 'Board (Clip) to the Timeline view, where it assumes the Default Still Length (set in your VT Preferences).

If you need a Still Clip to be longer or shorter, you simply drag its edge to set its duration.

If you need to have a Clip fade in or fade out, you simply drag the little triangle at the bottom of the clip's start and end.

Slider to the beginning of your Clip, expand the controls you wish to animate, and click on the Keyframe Indicator for that control to set a Keyframe with the control's current setting. Then move the Time Slider to the end of the Clip; Move, Rotate, Zoom, or Pan your image (getting real-time response on your video monitor); and new Keyframes will be created automatically!

You need absolute precision in your


"X" HERE MEANS CONTROL'S SPLINE IS VISIBLE HERE...
"NODES"
"INFLUENCES"

BY CLICKING THE SPLINES TAB YOU CAN SEE EVERY 'CHECKED' CONTROL

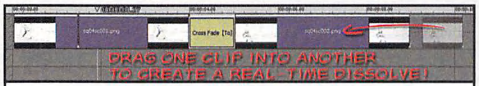
You want to add some real-time Camera Movement? Cool!

Just click on the Control Tree tab and the Positioning tab in the Control Tree's right-hand window and you'll see a representation of your Clip, complete with Safe Areas!

Drag the control elements to Move, Size and Rotate your Clip.

If you want the changes to Animate over time, just move the Time Camera Motion? Far out! Just click the Splines tab in the Control Tree window, and you'll see graphical representations of every "checked" control. You can add Nodes (Linear Interpolation—represented by "O's") and/or Influences (Smooth Interpolation—represented by "X's") by having the desired Interpolation selected at the top of the window and click/dragging on a Spline. (In the Control Tree windows, the Time

Slider shows the start and end for the selected clip, not the whole project.)



CROSS-DISSOLVES ARE MADE EASY WITH VT[3]

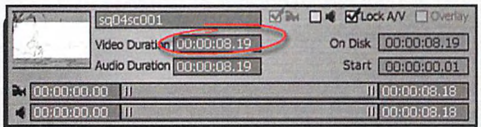
How 'bout doing a Cross Dissolve between this clip (that now has some nifty camera motion on it) and another? Just drag one clip so part of it "runs into" the other. That's it!

Just rewind the Time Slider and press the Spacebar to play, and you see all your effects in real time!

Lay in your recorded dialogue, temp music, and sound effects in the same way; play and re-play your work until everything shines with the kind of polish your story deserves; and your polished Animatic will support you as you move on, full bore, into Production!

## WORK REEL

Your polished Animatic will give you the framework for your completed film. In Production, a continually updated version of your Animatic becomes your Work Reel. You use this to get shot-length information for your Animators and Scene-Setup Artists. When footage comes out of Final, you drop it into your VT Edit Work Reel (as an "Offline Proxy" if your Final Cut will be on film), replacing the Storyboard(s) that the completed footage represents.

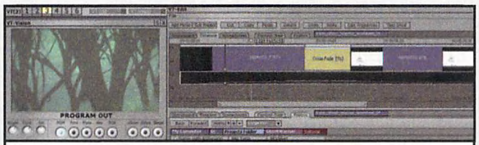

sq04sc001
☑ ☐ ☑ Lock A/V ☐ Overlay
Video Duration 00:00:08.19
Audio Duration 00:00:08.19
On Disk 00:00:08.19
Start 00:00:00.01
00:00:00.00 00:00:08.18
00:00:00.00 00:00:08.18

THE VIDEO DURATION DISPLAY

Selecting a Clip or Sub-Project (a group of Clips), you can instantly see the minimum duration you'll need to have animated for each shot. (I like to work with a head and tail of about half a second's worth of extra footage on each end to give me some "massage space" in editing.)

As each completed Scene comes out of "Final Lighting and Compositing," it is archived and dropped into the VT Edit Work Reel, replacing the Storyboard drawing.

Adjustments/fixes/tweaks are made from the expanded knowledge that seeing the animation in context gives the Director, and Production moves on.



COMPLETED SCENES ARE DROPPED INTO VT EDIT REPLACING STORYBOARDS

VT Edit's Paste Into (Inherit), Ripple Mode, and Slip-and-Slide functions make short work of the fine-detail adjustments that make the difference between "close" and "perfect." Be sure to explore the VT[3]'s manual and VT Edit's <F1> (Hotkey Help) for all sorts of tools and functions that make video editing practically painless!

THE FINAL EDITED SCENE

## FINAL EDIT

Because the edits have been constantly evaluated and re-evaluated as the Work Reel has evolved closer and closer to Final, with each Storyboard drawing replaced with its Finaled counterpart, there should be very little to do in your Final Edit.

That's the beauty of working with a Production Pipeline and tools that let you focus on doing your job!

If you're going to be mastering to DVD, something really neat about the VT[3] system is the fact that it can install Plug-Ins for other popular software to read its file formats, including VT Edit Projects!

So, if you're going to be using a program like TMPGEnc to create your MPEG 2 video files, you don't need to render an uncompressed version of your project; you just drag-and-drop your VT Edit Project file onto TMPGEnc, choose your settings, and let it run!

With hot keys, tools, functions, modes, and macros to minimize your effort to give you exactly what you're looking for, there's no other editing package I know in which I've actually enjoyed editing!

And when I hear people comment that the dream-like, Kirosawa-inspired rhythms of *Kaze, Ghost Warrior* made its 23 minutes seem like three.... I know I've got the effortless interface and tools of the VT[3] suite of programs to thank for the film feeling...well...effortless!

***Good Filmmaking!*** ■

**TIMOTHY "AMADHI" ALBEE** IS A FILMMAKER CURRENTLY WORKING FROM THE WILDS OF THE ALASKAN FRONTIER. HIS NEW SHORT FILM, *KAZE, GHOST WARRIOR,* WAS CREATED BY ONE PERSON, ON TWO HOME COMPUTERS, IN SIX MONTHS OF PRODUCTION, FOR $5,000. IT WAS DONE IN CONJUNCTION WITH HIS LATEST BOOK, *CGI FILMMAKING*, TO PROVE THE VALIDITY OF "MICRO-BUDGET" METHODS OF PRODUCTION AND PRODUCTION MANAGEMENT. "THE TECHNOLOGY OF TOMORROW, EXISTS TODAY, YOU JUST HAVE TO SEE WHAT THE ESTABLISHMENT DOESN'T."

ALBEE'S SERIES OF BOOKS ON FILMMAKING AND ANIMATION CAN BE FOUND WHEREVER BOOKS ARE SOLD.

*KAZE, GHOST WARRIOR* IS AVAILABLE ON DVD FROM HTTP://WWW.KAZEGHOSTWARRIOR.COM

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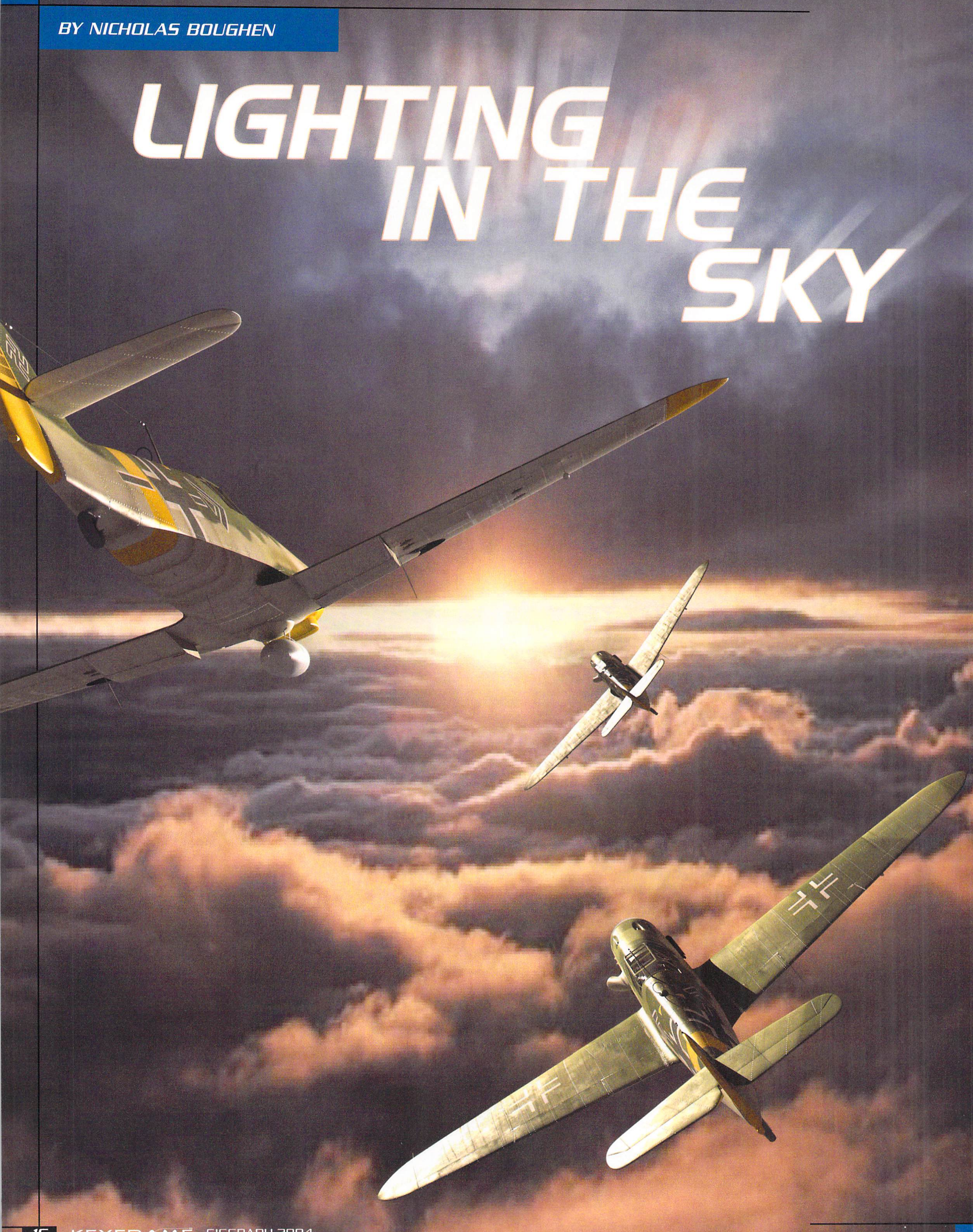
BY NICHOLAS BOUGHEN

# LIGHTING IN THE SKY



Many LightWave enthusiasts I have met are also aviation enthusiasts. How many amazingly detailed aircraft models have you seen by some seriously meticulous artists? I'm an airplane nut—enough so that I'm building my own biplane in my garage. So when I was asked to write a lighting tutorial for this very special edition of Keyframe, it seemed only natural that it involve some great airplane models to help describe some of the lighting principles we're tackling. After all, learning LightWave should be fun, don't you think?

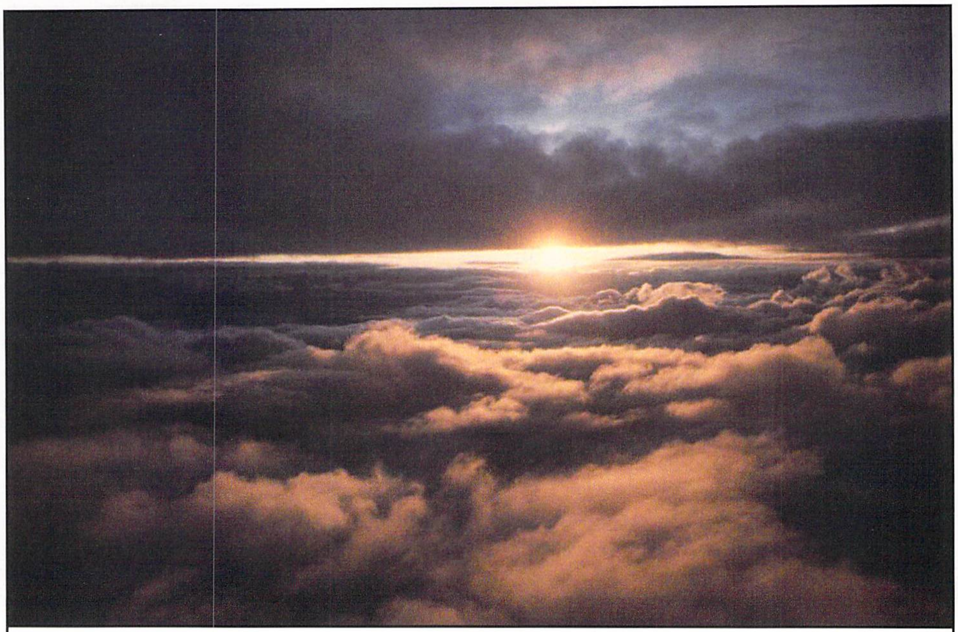
The cool thing about this project is that it will give an example not only of how a really good exterior lighting setup is accomplished but will also provide some insight into the challenges VFX artists face every day trying to create and light photo-real elements that match well to the background image (AKA "the plate").

First, I borrowed a couple of great aircraft models from Dan Mayer, here at Rainmaker. Dan's a bit of a modeling god and is a little scary when it comes to detail.

ONE OF OUR AIRPLANE MODELS

Next I surfed around the net until I found a suitable aerial shot of the ground I could use for my background. The right aerial photograph is crucial to the shot because it will determine everything about the shot lighting including key direction, color and intensity to bounce types.

This image was photographed by Michael R. Jones from the cockpit of a Chinook helicopter. Thanks to Michael for permission to use the image in this tutorial.



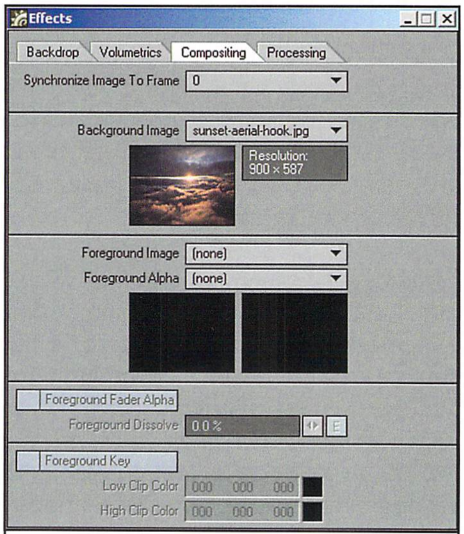
THE RIGHT PHOTO IS CRUCIAL TO THE SHOT

The great thing about this image is that it defines all the light positions, angles and hues. Probably the most important thing to understand about lighting for this image is that there are two distinctly different light types. First, the sun. The sun is really huge but is also very far away, so its light rays SEEM to be all parallel. They are not! But they're pretty close. If the sun's light rays were all parallel, then light would only go one direction away from the sun (which it does not), and all shadows from the sun would be uniformly hard-edged all the way around (which they are not).

The second light sources are the sky and clouds. Because sunlight is diffused through these atmospheric events, they, themselves, seem to become luminous and add light to the scene. It is "stolen" or "borrowed" light really, since it all comes from the sun. Nonetheless, light comes from these areas, so we can consider them light sources. The main difference between them and the sun is that they are very large, local light sources, meaning that light is coming from many directions, and the shadows will be extremely soft. We'll see that in the image shortly.

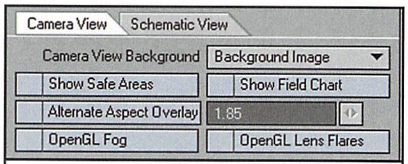
I'll go ahead and load the image into Layout, putting it in the background on the compositing panel. And setting it to display in the display panel.

Be sure to set your OpenGL Texture resolution to 1024 X 1024.



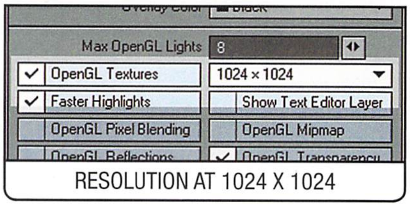
Synchronize Image To Frame: 0
Background Image: sunset-aerial-hook.jpg
Resolution: 900 × 587
Foreground Image: (none)
Foreground Alpha: (none)
Foreground Dissolve: 0.0 %
Low Clip Color: 000 000 000
High Clip Color: 000 000 000

BACKGROUND IMAGE ON COMPOSITING PANEL



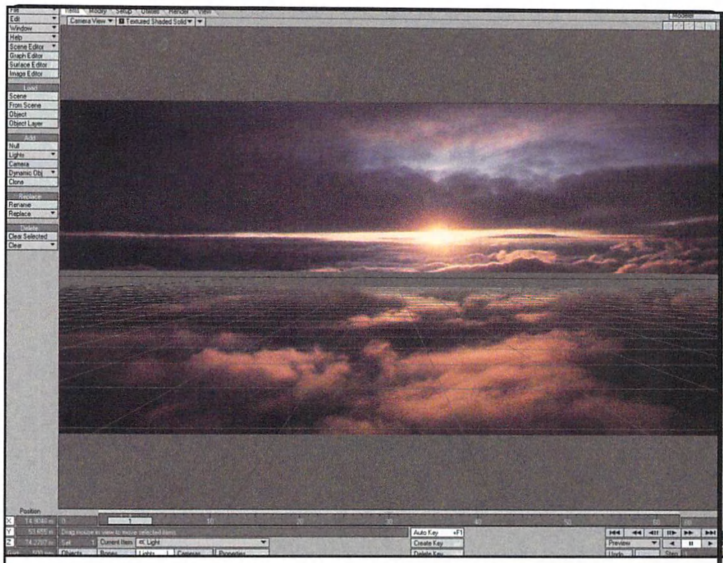
Camera View Background: Background Image
☐ Alternate Aspect Overlay: 1.85

SET THE IMAGE TO DISPLAY

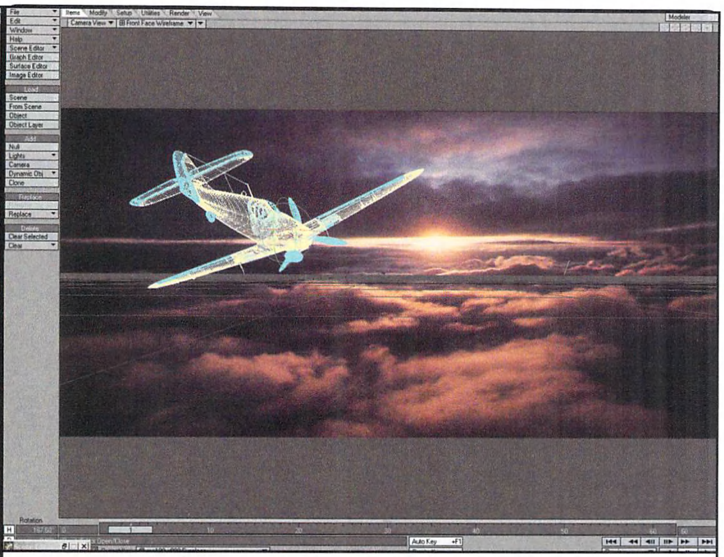


Max OpenGL Lights: 8
☑ OpenGL Textures: 1024 × 1024

RESOLUTION AT 1024 X 1024



OUR BACKGROUND IS NOW VISIBLE IN MODELER



THE AIRPLANE MODEL PLACED OVER THE BACKGROUND

Now you should see the image in the background.

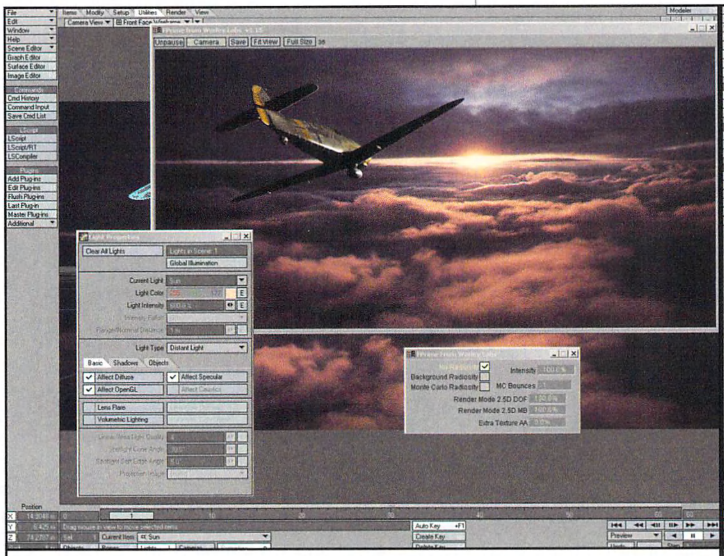
I'll position the aircraft in an interesting way. Of course, if this were a real visual effects shot, the position and animation of the aircraft would already be determined and approved by the VFX supervisor before proceeding to lighting.

Now we'll need to decide where our light sources are coming from. The most obvious light source is the sun. Normally I'd use an area light for sunlight so the shadows soften over distance, but, since we're putting the ME109 in the scene and it won't be casting shadows on anything around it, we can get away with using a distant light that has only hard-edged shadows.

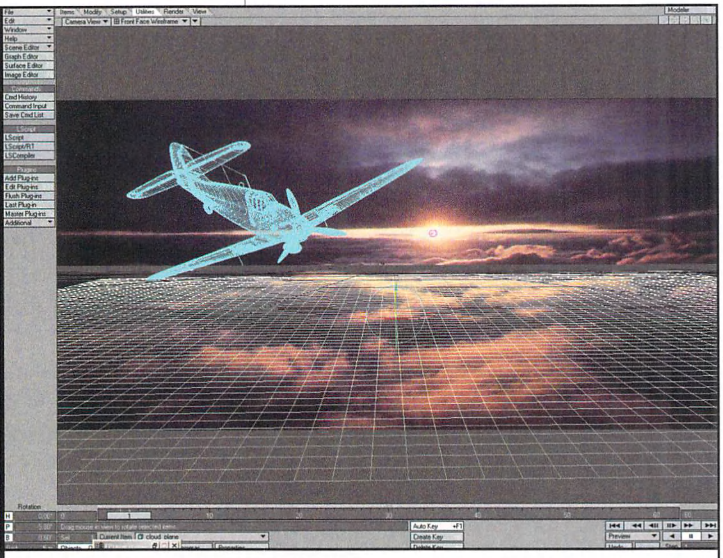
I'll go ahead and throw in a distant light, position in where the sun is, and try a render. And, by the way, I'll be rendering this using Worley Labs' FPrime because I'm planning to use some radiosity, and nothing renders radiosity as quickly or with as high quality as FPrime.

Now that's not too bad for a first look. Not complete by any means, but not bad. You may notice, if you look on the light properties panel, that my key light is set to 600 percent. Some may think this awfully high, but it's just a number. An upper limit to lighting levels is not 100 percent. For example, a light bulb in your house may be turned on and be burning at 100 percent brightness, however, it is no match for the sunlight outside, which is also burning at 100 percent brightness (even though we don't get 100 percent of the light through our atmosphere). So don't think of the intensity number as meaning anything other than a setting from which you may go higher or lower. I can justify the use of 600 percent simply by looking at the image and saying, "Yes, that looks about right."

Now, there are two main light sources missing from this image. One is the dark blue sky above, and the other is the brightly lit clouds below. The sky extends above the scene in a



AN INITIAL RENDER OF OUR SCENE WITH A SINGLE DISTANT LIGHT POSITION

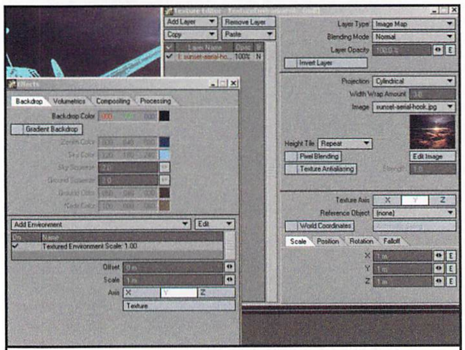


THE BACKGROUND IS PROJECTED ON THE PLANE USING FRONT PROJECTION dome. Since we're already using the photograph as a background image, we can use radiosity to make the backdrop emit light into the scene. This will almost work for the clouds below, but, since they're in a plane rather than a dome, the lighting angles might not be exactly perfect. This may be a subtle point, but, if you want your lighting to look just exactly right, it pays to be detailed in your analysis of the lighting and in your implementation as well.

So I'm going to put a polygon plane in the scene about where the clouds lie. I'd normally use just a single, rectangular polygon, but, in this case I'll subdivide the polygon so you can see where I'm placing it in the scene.

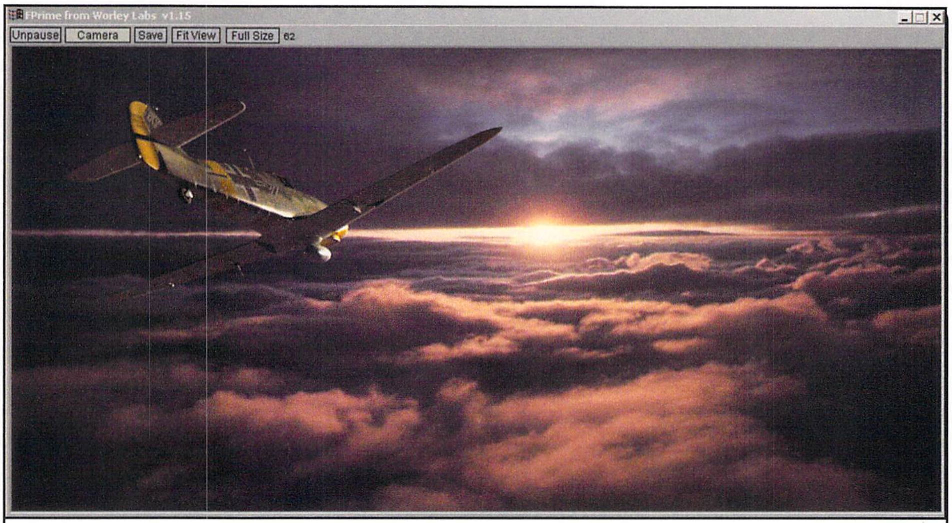
Next, I'll project the background image onto the plane using front projection. Once I turn the texture luminosity up to 100 percent and the diffuse value to 10 percent, you'll never see it in the render, but it will be there just below the aircraft. Since the cloud polygons are luminous, they will emit light once I turn on Monte Carlo radiosity. Since the cloud polygons are now the exact colors of the clouds, the light emitted will be exactly the various colors, positions, shapes and sizes that it should be. The polygons are essentially acting like a large, multicolored area light.

To get the sky into the radiosity solution, we'll need to place our photograph in the backdrop. My favorite way to do this is to use Textured Environment to place the image in as a cylindrical map.

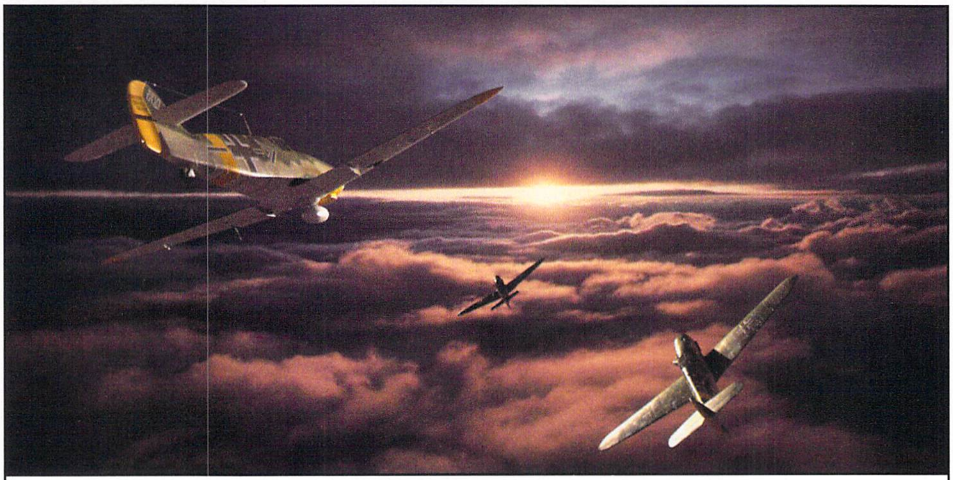

Texture Editor
Add Layer
Remove Layer
Copy
Paste
Layer Name
Opac
Invert Layer
Effects
Backdrop
Volumetrics
Compositing
Processing
Gradient Backdrop
Add Environment
Edit
On
Name
Edit Image
Pixel Blending
Texture Antialiasing
World Coordinates
Scale
Position
Rotation
Falloff
Texture

sunset-aerial-ho... 100% N
Layer Type: Image Map
Blending Mode: Normal
Layer Opacity: 100.0%
Projection: Cylindrical
Width Wrap Amount: 1.0
Image: sunset-aerial-hook.jpg
Height Tile: Repeat
Texture Axis: X Y Z
Reference Object: (none)
X: 1 m
Y: 1 m
Z: 1 m
Textured Environment Scale: 1.00
Offset: 0 m
Scale: 1 m
Axis: X Y Z

USE TEXTURED ENVIRONMENT TO PLACE THE IMAGE IN AS A CYLINDRICAL MAP


FPrime from Worley Labs v1.15
Unpause
Camera
Save
Fit View
Full Size
62

OUR INITIAL RENDER LOOKS PRETTY GOOD

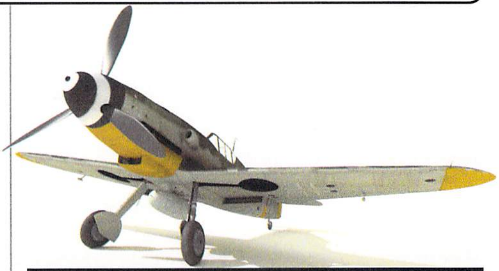


AFTER TAKING TIME TO PLAY WITH THE SHOT TO GET JUST THE RIGHT LOOK

Let's render that out and have a look.

Now that's not too bad looking! The real beauty here is that this frame, rendered at 1000 X 500 pixels, only took a few minutes to render with Monte Carlo radiosity set to 10 bounces!! As a lighter, that is really, really exciting! A render like this in LightWave's native renderer would take at least a day.

I think I'll play with the shot a little while and see what I can come up with. Always remember that lighting to a plate is as simple as identifying and understanding the light sources, then using the appropriate tools to recreate those light sources. ■



**NICHOLAS BOUGHEN** IS A SENIOR VISUAL EFFECTS ANIMATOR AND LEAD LIGHTING ARTIST AT RAINMAKER IN VANCOUVER, BRITISH COLUMBIA, CANADA. HIS CREDITS INCLUDE *I, ROBOT*, *GARFIELD*, *GOODBOY!*, *STARGATE SG-1*, *STARGATE: ATLANTIS*, *DEAD LIKE ME*, *AFTERSHOCK:EARTHQUAKE IN NEW YORK*, *VOYAGE OF THE UNICORN*, *SNOW WHITE*, AND OTHERS.

NICHOLAS IS THE AUTHOR OF THE BEST SELLING LIGHTWAVE BOOK *LIGHTWAVE 3D 7.5 LIGHTING*, AND ITS NEW 2ND EDITION *LIGHTWAVE 8 LIGHTING*. HE HAS RECENTLY RECEIVED AN EMMY NOMINATION FOR OUTSTANDING SPECIAL VISUAL EFFECTS IN A SERIES FOR HIS WORK ON THE TELEVISION SERIES, *DEAD LIKE ME*.

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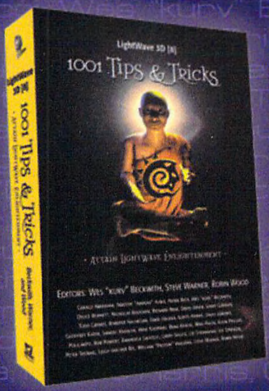
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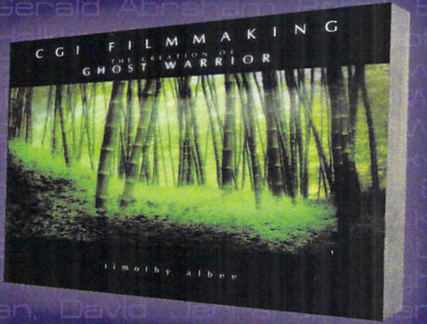
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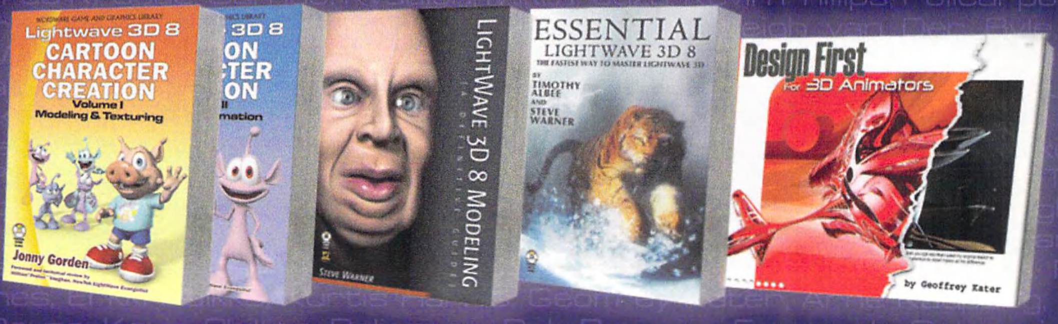
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